



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁷ : G09G 5/08	A1	(11) International Publication Number: WO 00/45366 (43) International Publication Date: 3 August 2000 (03.08.00)
(21) International Application Number: PCT/US00/02295 (22) International Filing Date: 28 January 2000 (28.01.00) (30) Priority Data: 60/117,902 29 January 1999 (29.01.99) US (71)(72) Applicant and Inventor: ASHBY, Mark [US/US]; 10 Belcrest, Laguna Niguel, CA 92677 (US). (74) Agents: KREBS, Robert E. et al.; Burns, Doane, Swecker & Mathis, LLP, P.o. Box 1404, Alexandria, VA 22313-1404 (US).		(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i>
(54) Title: IMPROVED MOUSE AND METHOD OF USING <div data-bbox="308 1134 1266 1491"> </div> (57) Abstract <p>An improved computer mouse (20) includes a hand support platform (30) to reduce user discomfort and injury and train a user to properly use a mouse. The hand support platform supports portions of the hand (10), wrist, and arm of a user. The platform may be rigid or semi-rigid, and may be unitary or multi-part construction. The platform may be part of the mouse housing or may be a separate piece removably or permanently attached to the mouse. A top surface of the platform supports portions of the third, fourth, and fifth metacarpal bones of the hand and the hanate, pisiform, and triquetral bones of the wrist.</p>		

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IMPROVED MOUSE AND METHOD OF USING

This application claims priority based on U.S. Provisional Application No. 60/117,902 filed January 29, 1999, which is incorporated herein by reference in its entirety.

5 **BACKGROUND OF THE INVENTION**

Field of the Invention

The invention relates to a computer mouse, and more particularly, the invention relates to an improved computer mouse with a hand support platform which reduces user discomfort.

10 **Brief Description of the Related Art**

The computer mouse is an increasingly essential component in the operation of modern personal computers and workstations. For many applications, the mouse is the primary interface between operator and computer. Some examples of these are graphics and design programs, and menu and selection
15 intense software such as those utilized in numerous search engines, and games.

The conventional computer mouse has a housing configured to be received in a user's fingers and a portion of the user's palm. A user places their hand on the mouse body with the second and third fingers positioned over the mouse selection buttons. The basic design and method of use of the current mouse
20 devices results in physical distress to the operator evidenced by a very high incidence of repetitive motion injuries, maintained stress injuries, and general user discomfort and fatigue.

The prolonged use of common mouse devices creates significant distress for the operator. More specifically, distress for the operator is created as follows.

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Maintaining fingers in proper position (generally horizontal, palm down) over selection buttons requires exaggerated pronation of the forearm, associated with significant maintained stress on muscles such as pronator teres and pronator quadratus. Maintaining little or no pressure on the selection buttons requires
5 extension of the hand and fingers, associated with significant maintained stress on numerous extensor muscles in a dorsal region of the hand and wrist.

Maintaining the mouse in an orientation intuitively associated with X-Y movement of the cursor requires clockwise rotation of the right hand. This adduction of the hand places muscles in and around the pisiform bone in a
10 condition of maintained stress.

Augmented pronation of the forearm is commonly accomplished by lifting the elbow. This places muscles in the shoulder, neck, and upper back region in a condition of significant maintained stress.

Augmented pronation of the forearm, as accomplished by lifting the elbow,
15 also requires exaggerated extension of the hand and fingers in order to hold little or no pressure on the selection buttons. This creates even more significant maintained stress in the extensor muscles in the dorsal region of the hand and wrist.

Augmented pronation of the forearm, as accomplished by lifting the elbow,
20 translates to a more lateral elbow position, requiring additional clockwise rotation of the right hand. This exaggerated adduction of the hand places muscles in and around the pisiform bone in an even greater condition of maintained stress.

Trapping sides of the mouse between the palmar-tip of the thumb and the inner/palmer tip of the fourth and fifth finger (within a space approximately equal
25 to the width of three fingers) places the muscles required for flexure of the palmer region (i.e. flexor retinaculum) in a condition of maintained stress. This is significantly magnified when the user is already experiencing extension of the hand and fingers and/or adduction of the hand.

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Prolonged pressure concentrated on the palmar-pisiform region of the hand due to resting the weight of the arm and hand on this region creates significant discomfort.

5 Repetitive motion associated with the operation of the mouse is more likely to cause discomfort or injury when combined with the above-described distress.

Numerous attempts to improve the mouse and/or its method of use to reduce or eliminate these sources of distress exist in the prior art. In addition, numerous modifications to mouse pads and separate pads to rest the wrist or palm upon exist in the prior art. Finally, numerous wrist supports exist that attempt to
10 address these issues.

While these efforts may address specific issues and circumstances, they fail to provide complete relief for the wide spectrum of computer users. In addition, these devices fail to train the user to properly use a mouse.

A solution providing relief and prevention of the above-described problems
15 would provide great benefit. Moreover, a simple solution allowing successful utilization by a wide spectrum of users could make this benefit available to far more users than anything in the prior art.

SUMMARY OF THE INVENTION

The present invention relates to a computer mouse and a hand support
20 platform for reducing user discomfort and injury and for training a user to properly use a mouse.

In accordance with one aspect of the present invention, a computer mouse includes a mouse housing containing a tracking system, two selection buttons positioned on an anterior portion of the mouse housing, and a platform secured to
25 and extending from a posterior portion of the mouse housing. The platform is configured to support portions of a user's hand and wrist.

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In accordance with another aspect of the present invention, a hand support platform for a computer mouse includes an anterior U-shaped surface configured to receive a posterior surface of a computer mouse, and a top surface extending from the anterior surface and configured to support portions of the third, fourth, and fifth metacarpal bones of the hand and the hamate, pisiform, and triquetral bones of the wrist.

In accordance with a further aspect of the invention, a method of teaching a user to use a computer mouse includes the steps of attaching a hand support platform to a computer mouse; using the computer mouse with the hand support platform attached for a period of time; and removing the hand support platform.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will now be described in greater detail with reference to the preferred embodiments illustrated in the accompanying drawings, in which like elements bear like reference numerals, and wherein:

FIG. 1 is an ulnar side view of a right hand of a user positioned for use over a mouse (shown in phantom lines) with a hand support platform according to the present invention;

FIG. 2 is a radial side view of the right hand of a user positioned for use over the mouse and hand support platform of FIG. 1;

FIG. 3 is a front view of the right hand of a user positioned for use over the mouse and hand support platform of FIG. 1;

FIG. 4 is a top view of the right hand of a user positioned for use over the mouse and hand support platform of FIG. 1;

FIG. 5 is a top perspective view of a first embodiment of a hand support platform according to the present invention;

FIG. 6 is a top view of the hand support platform of FIG. 5;

FIG. 7 is a side view of the hand support platform of FIG. 5;

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FIG. 8 is a bottom view of the hand support platform of FIG. 5;

FIG. 9 is a top perspective view of a second embodiment of a hand support platform according to the present invention;

FIG. 10 is a top view of the hand support platform of FIG. 9;

5 FIG. 11 is a side view of the hand support platform of FIG. 9;

FIG. 12 is a bottom view of the hand support platform of FIG. 9;

FIG. 13 is a top perspective view of a third embodiment of a hand support platform according to the present invention;

FIG. 14 is a top view of the hand support platform of FIG. 13;

10 FIG. 15 is a side view of the hand support platform of FIG. 13;

FIG. 16 is a bottom view of the hand support platform of FIG. 13;

FIG. 17 is a top perspective view of a fourth embodiment of a hand support platform according to the present invention;

FIG. 18 is a top view of the hand support platform of FIG. 17;

15 FIG. 19 is a side view of the hand support platform of FIG. 17;

FIG. 20 is a bottom view of the hand support platform of FIG. 17;

FIG. 21 is a top perspective view of the hand support platform of FIG. 5 formed from a flat sheet;

20 FIG. 22 is a plan view of a flat blank for forming the hand support platform of FIG. 21; and

FIG. 23 is a top view of the right hand of a user positioned for use over the mouse and hand support platform of FIG. 13.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

25 The improved mouse includes a hand support platform 30 which supports portions of the hand, wrist, and/or arm of a user above a surface on which the mouse rests. The hand support platform 30 increases user comfort, prevents injury, and trains the user to properly use a mouse. The platform 30 may be rigid

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or semi-rigid, and may be of unitary or multi-part construction. The platform 30 may be part of the mouse housing or may be a separate piece removably or permanently attached to the mouse by any suitable means known to those skilled in the art. It is also appreciated that providing the platform 30 in different shapes and in different locations on the mouse can provide additional benefit.

FIGS. 1-4 show a mouse 20 with a hand support platform 30 in a user's right hand 10. The hand 10 having first 1, second 2, third 3, fourth 4, and fifth 5 fingers is positioned over the mouse 20 (shown in double phantom lines) and the hand support platform 30.

The platform 30 is a three dimensional member with a top surface which is contoured to accommodate a user's hand. An anterior portion 32 of the platform 30 has a recess which accommodates and is connected to the rounded rear surface of a conventional computer mouse 20. The recess in the anterior portion 32 of the platform 30 is substantially U-shaped to accommodate the mouse. The anterior portion 32 of the platform extends above the posterior portion of the mouse and comes to a peak 36 under the user's palm. The platform 30 preferably tapers in height from a maximum height at the peak 36 near the anterior portion 32 to a minimum height at a posterior portion 34.

The platform 30 provides support and elevation of the hand generally under the third fourth, and/or fifth metacarpal bones of the hand. The posterior portion 34 of the platform 30 extends generally under and provides support for the hamate, pisiform, and triquetral bones of the wrist and may continue generally parallel to and under at least the distal ulna of the arm.

Adjustment of the platform size, shape, or stiffness will allow individual users to accommodate their specific hand size and to address their particular needs. For example, a selection of different platforms may be provided, representing different sizes, shapes, stiffness, etc. The platform 30 may be made of a malleable material, such as mild temper metals, thermoformable plastics, foams, or gels.

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The malleable material will allow adjustment of the platform shape to the user's needs and contouring of the platform to a user's specific hand shape. Platforms may also be supplied with removable, break-away, or cut-away portions.

Adjustment of the vertical and horizontal position of the platform 30 relative to the mouse 20 will allow individual users to better address their specific needs. This may be accomplished by providing multiple U-shaped recesses or pockets in the platform to receive the posterior portion of the mouse, semi-permanent attachments such as snaps or Velcro, or any adjustable attachment means known to those skilled in the art.

FIGS. 5-20 illustrate four different embodiments of the platform 30a, 30b, 30c, and 30d. Each of the platforms 30a-30d include a top surface 40a-40d, a bottom surface 38a-38d, and an anterior surface 42a-42d. The embodiments of FIGS. 5-20 differ from the embodiment of FIGS. 1-4 in that the hand and wrist rest on a thin sheet of material rather than the three dimensional platform of FIGS. 1-4. The thin sheet of material of the platforms 30a-30d supports the hand and wrist for motion over a working surface on which the mouse is placed. Although the embodiments of FIGS. 5-20 have been shown to be formed from a material having a uniform thickness, it should be understood that each of the platforms may be have a varying thickness. For example, the top surface 40a-40d may be contoured to the user's hand.

The top surfaces 40a-40d preferably include a surface feature which prevents the user's hand from slipping on the platform 30a-30d. This surface feature may be a tractive surface, a tractive surface coating, a contoured surface, or a connecting member for connecting the user's hand to the platform. The bottom surface 38a-38d may include a low friction material, coating, or friction reducing features. The anterior surface 42a-42d is connected to an edge of the mouse 20 by adhesive, Velcro, fasteners, a snap fit, or other temporary or permanent attachment method.

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FIGS. 5-8 illustrate a platform 30a having a U-shaped anterior surface 42a which extends along left and right sides of the mouse 20. The platform 30a of FIGS. 5-8 is symmetrical and can be used by left or right handed users. The platform 30a provides right and left side support members 44a, 46a for supporting the first, fourth, and fifth fingers of the user's hand. The platform 30a also includes a rear support surface 48a for supporting the user's palm and/or wrist. The platform 30a may be provided with break-away portions which allow the user to remove a portion of the platform to achieve configurations such as those illustrated in FIGS. 9-20.

FIGS. 9-12 show an alternative embodiment of a platform 30b in which the left side support 44b is smaller in width than the right support 46b. The left side support 44b is provided for supporting the right handed user's first finger while the right side support 46b supports the fourth and fifth fingers.

FIGS. 13-16 illustrate an alternative embodiment of the platform 30c in which the left side support has been removed.

Finally, FIGS. 17-20 illustrate an alternative embodiment of the platform 30d in which the left and right side supports have been omitted. The rear support portion 48d of the platform 30d supports the user's palm and wrist, and optionally the user's arm.

FIGS. 21 and 22 illustrate the formation of the platform 30a from a blank 50 of flexible material. The blank 50 shown in FIG. 22 has a plurality of slits 52 formed around the interior U-shaped portion of the blank. As shown in FIG. 21, the anterior surface 42a is folded along a fold line 54 to form a substantially 90 degree angle with the top surface 40a.

The devices according to the present invention may further include any means known to one skilled in the art of maintaining the position of the user's hand with respect to the platform. This could include, but is not limited to extensions of the platform or mouse, tractive surfaces, adhesives, pressure

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sensitive tape, gloves, adjustable gloves, stretchable gloves, wraps, and the like. The embodiment shown in FIGS. 1-4 provides a platform with a contoured tractive top surface to maintain the position of the platform 30 with respect to the user's hand 10. Although the platform 30 has been described as attached to the mouse, it should be understood that the platform may also be attached to the user's hand and will move with the mouse due to the user holding the mouse.

Maintained stress associated with exaggerated pronation and augmented pronation is reduce or eliminated by the present invention as follows. When the user positions their hand for mouse operation, pronation of the user's forearm is accomplished or enhanced as follows. The platform 30 creates an upward force against the outer-palmar side of the hand and ulna. The unsupported weight of the inner hand combined with this upward force creates a moment sufficient to cause the pronation required for proper finger position over the selection buttons. In this way, the operator distress associated with exaggerated pronation of the forearm and augmented pronation is minimized or eliminated.

Maintained stress associated with extension and exaggerated extension of the hand and fingers is reduce or eliminated by the present invention as follows. When the user positions their hand 10 for mouse operation with the assistance of the platform 30, the user's relaxed selection fingers require significantly less, if any, hand and finger extension to be maintained over selection buttons. In this way, the operator distress associated with extension and exaggerated extension of the hand and fingers is minimized or eliminated. Prior art devices do little or nothing to properly position the selection fingers, creating the need for extension of the hand and fingers.

Maintained stress associated with adduction and exaggerated adduction of the hand is reduced or eliminated by the present invention as follows. When the user positions their hand for mouse operation, the anterior portion of the platform extends upwardly, providing support and elevation generally under the third,

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fourth, and/or fifth metacarpal bones. The platform rear support 48 extends generally under the hamate, pisiform, and triquetral bones and may continue generally parallel to and under at least the distal ulna. The platform provides support and elevation in these areas. This results in an improved selection finger orientation (i.e. more clockwise for the right handed example being discussed). In this way, the operator distress associated with adduction and exaggerated adduction of the hand is minimized or eliminated.

Maintained stress associated with flexure of the palmer region is reduced by the present invention as follows. Trapping the sides of the mouse between the palmar-tip of the thumb and the inner/palmer tip of the fourth or fifth finger (within a space approximately equal to the width of three fingers) places the muscles required for flexure of the palmer region (i.e. flexor retinaculum) in a condition of maintained stress. When the user positions their hand for mouse operation with the platform 30, trapping is not necessary because the hand is retained by the platform. Accordingly, concurrent issues of extension and adduction are reduced or eliminated, making flexure of the palmer region significantly less taxing.

Distress associated with prolonged pressure on the palmar-pisiform region of the hand is reduced-eliminated by the present invention as follows. The weight of the hand and arm is distributed across the hand and wrist by the platform 30 reducing the point pressure on the palmar-pisiform region. In this way, the operator distress associated with prolonged pressure on the palmar-pisiform region of the hand is reduced or minimized.

Repetitive motion injuries are reduced or eliminated by the present invention as follows. When the user positions their hand on the mouse 20 and platform 30 for mouse operation, the muscles of the fingers, hand, wrist, and forearm require little if any maintained stress. The user's hand is essentially relaxed. The repetitive motion commonly associated with mouse operation is less

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likely to create operator distress in this circumstance. In this way, repetitive motion injuries can be reduced.

The invention also forces or trains the user to move the mouse without finger movement which results in improved mouse technique when the mouse is
5 used with or without the platform. In particular, by fixing the relationship of the mouse relative to the user's palm, the platform prevents the user from moving the mouse with finger movement. Thus, the invention reduces the chance of injury to structures involved with finger movement. In addition, the need to trap the sides
10 of the mouse between the first and fourth or fifth finger is greatly reduced. Much or all of the force required to move the mouse in translation is transmitted to the mouse via the hand on the platform.

It is appreciated that a right-handed device shown for demonstration purposes only, and the invention is not limited in scope to right handed users.

While the invention has been described in detail with reference to the
15 preferred embodiments thereof, it will be apparent to one skilled in the art that various changes and modifications can be made and equivalents employed, without departing from the present invention.

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WHAT IS CLAIMED IS:

1. A computer mouse comprising:
a mouse housing containing a tracking system;
at least one selection button positioned on an anterior portion of the mouse housing;
a platform secured to and extending from a posterior portion of the mouse housing, the platform configured to support portions of a user's hand and wrist.
2. The computer mouse of Claim 1, wherein the platform is removably secured to the mouse housing.
3. The computer mouse of Claim 2, wherein a height of the platform is adjustable with respect to a height of the mouse housing.
4. The computer mouse of Claim 1, wherein the platform is permanently fixed to the mouse housing.
5. The computer mouse of Claim 1, wherein the platform includes an anterior surface and a top surface, the anterior surface configured to be connected to a posterior surface of the mouse housing, and the top surface arranged at substantially a 90 degree angle to the anterior surface.
6. The computer mouse of Claim 5, further comprising a surface feature on the top surface to prevent a user's hand from slipping on the platform.

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7. The computer mouse of Claim 6, further comprising a bottom surface of the platform having a friction reducing surface.

8. The computer mouse of Claim 1, wherein the platform is formed of a malleable material.

9. A hand support platform for a computer mouse, the platform comprising:

an anterior surface configured to receive a posterior surface of a computer mouse; and

a top surface extending from the anterior surface and configured to support portions of the third, fourth, and fifth metacarpal bones of the hand and the hamate, pisiform, and triquetral bones of the wrist.

10. The platform of Claim 9, further comprising means for connecting the anterior surface to the computer mouse.

11. The platform of Claim 9, wherein the top surface includes a side support extending along a side surface of the computer mouse, the side support configured to support portions of the fourth and fifth fingers.

12. The platform of Claim 9, wherein the top surface includes two side supports extending along opposite side surfaces of the computer mouse, the side supports configured to support portions of the first, fourth, and fifth fingers.

13. The platform of Claim 9, wherein the top surface is arranged at an angle of about 90 degrees with respect to the anterior surface.

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14. The platform of Claim 9, wherein a height of the top surface from a surface on which the computer mouse rests tapers from a largest height at the anterior surface to a smallest height at a free edge of the platform.

15. The platform of Claim 9, wherein platform is formed of a malleable material.

16. The platform of Claim 9, wherein the platform extends upward to a peak and wherein the peak is located over a portion of the computer mouse when the anterior surface receives the posterior surface of the computer mouse.

17. A hand support platform for a computer mouse, the platform comprising:

a platform having a top surface configured to support portions of the third, fourth, and fifth metacarpal bones of the hand and the hamate, pisiform, and triquetral bones of the wrist when a computer mouse is received in a user's hand; and

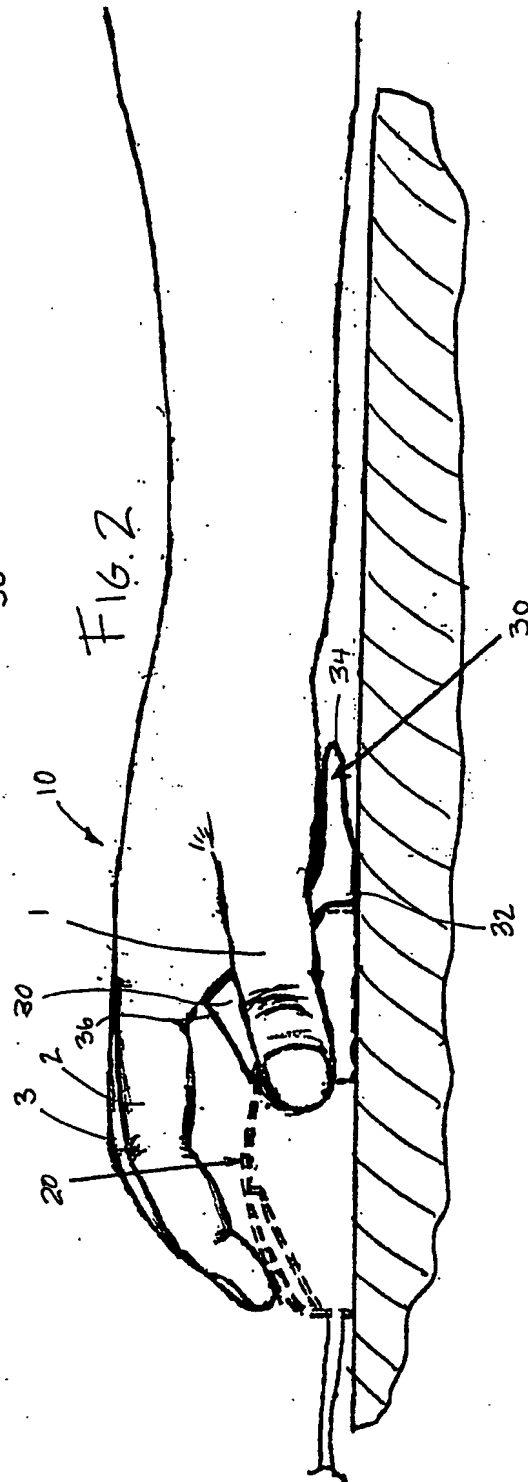
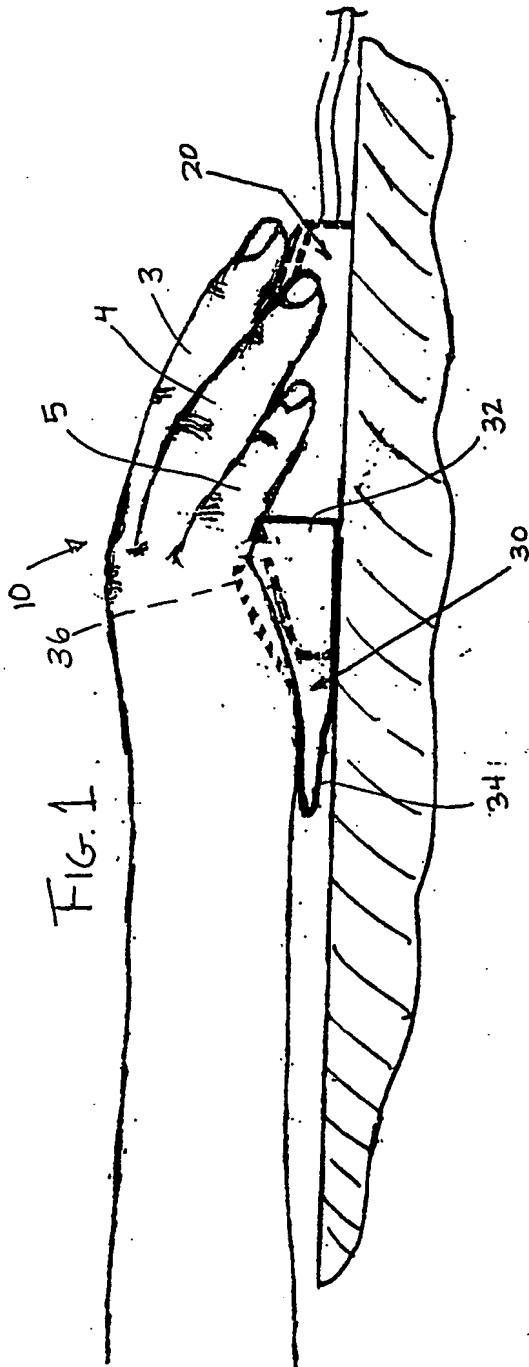
means for moving the platform with the mouse as the mouse is moved by the user's hand.

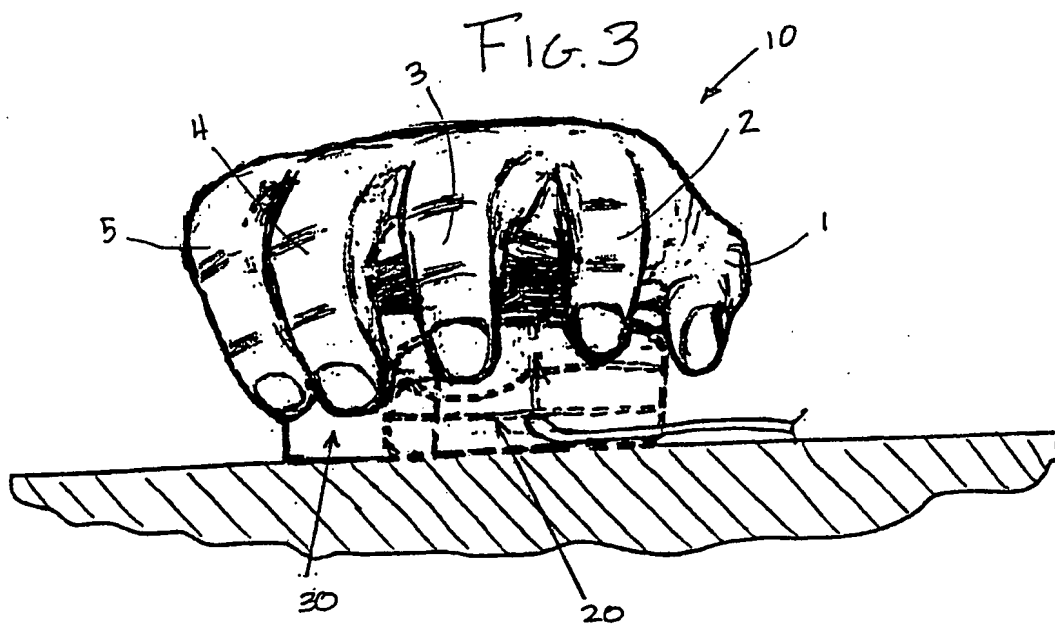
18. The hand support platform of Claim 17, wherein the means for moving the platform includes attachment means for attaching the platform to the computer mouse.

19. The hand support platform of Claim 17, wherein the means for moving the platform includes attachment means for attaching the platform to a user's hand.

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20. A method of teaching a user to use a computer mouse comprising:
attaching the hand support platform of Claim 9 to a computer
mouse;
using the computer mouse with the hand support platform attached
for a period of time; and
removing the hand support platform.





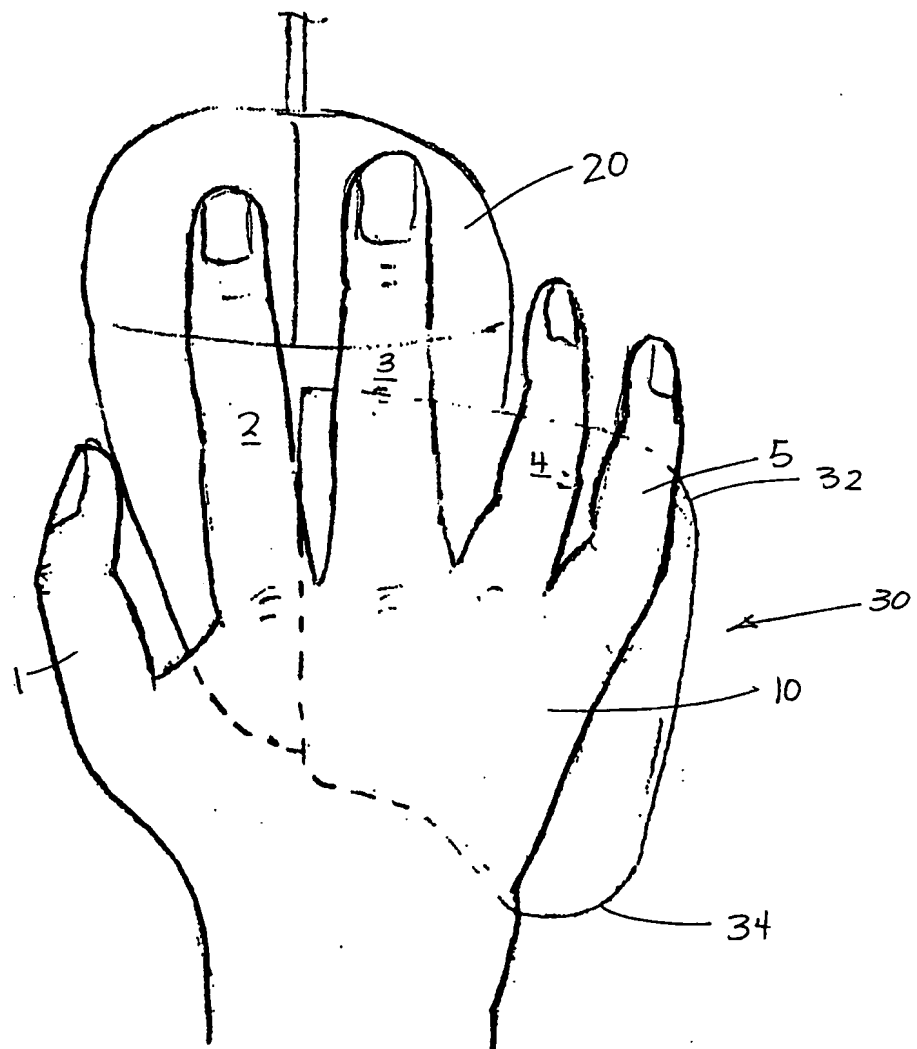


FIG. 4

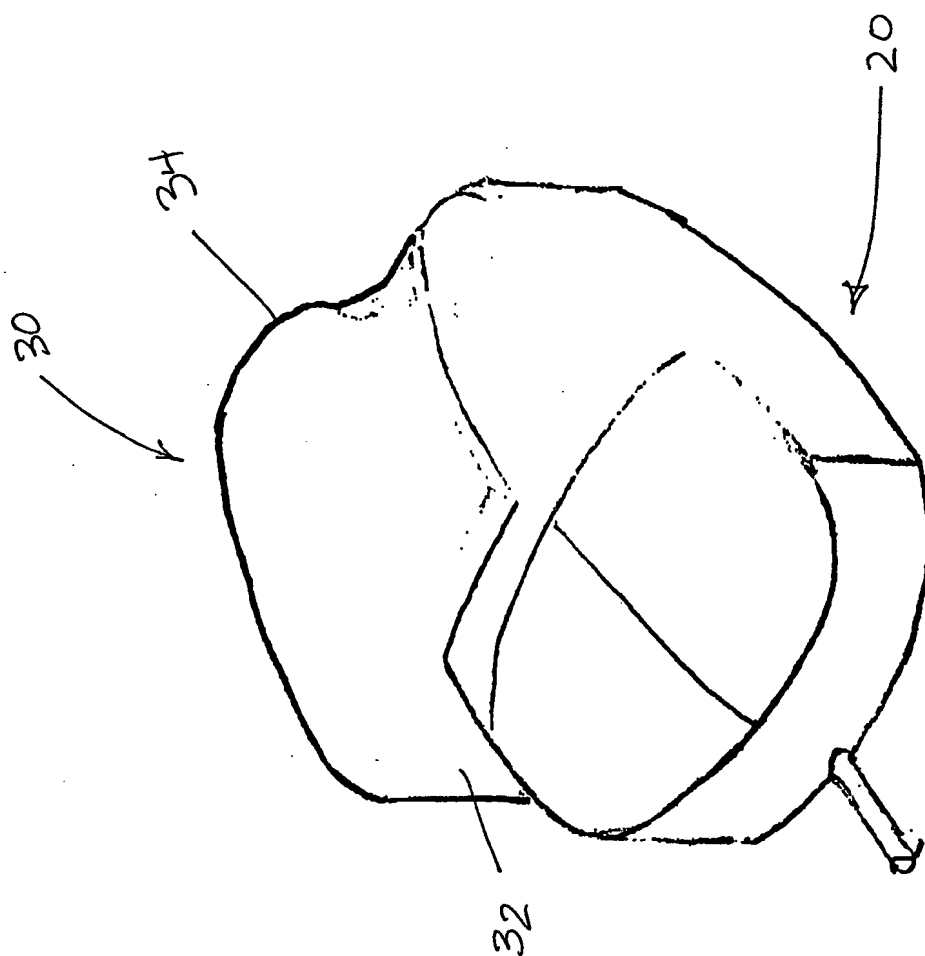
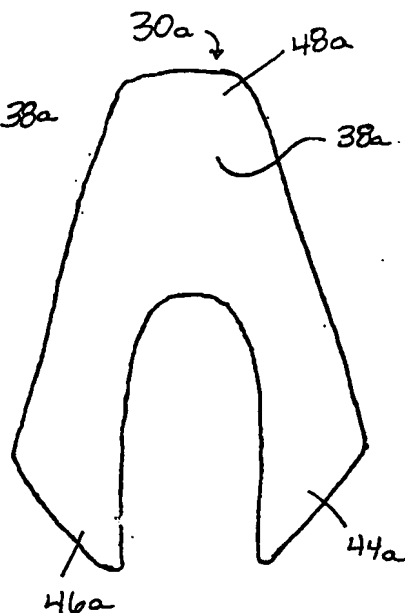
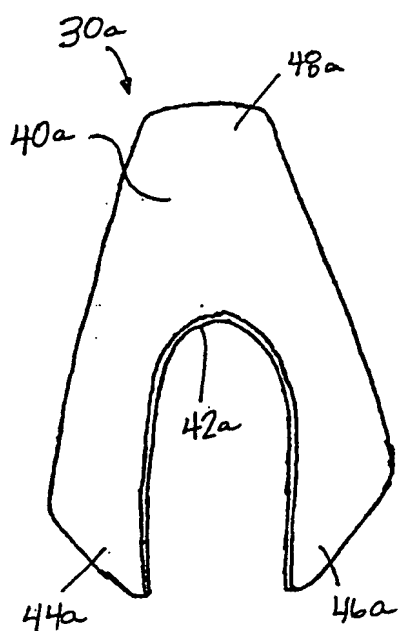
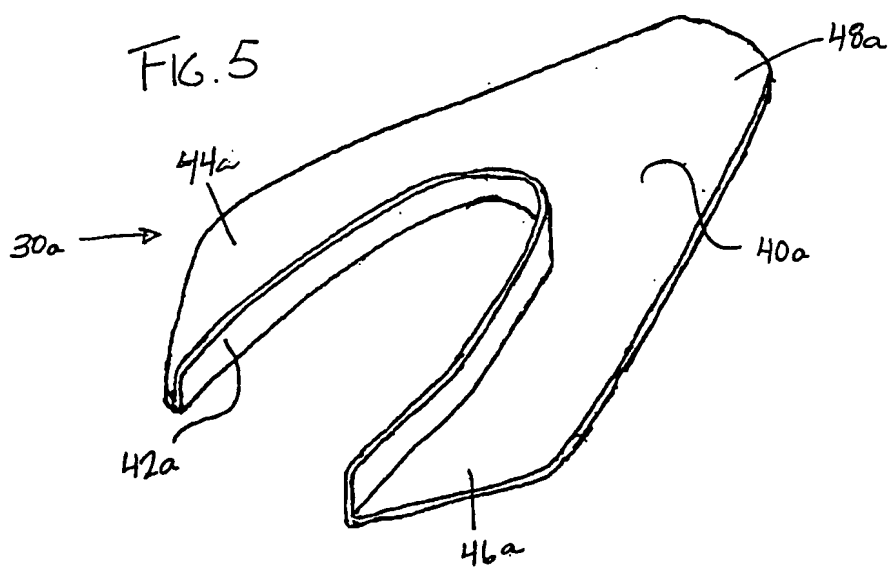
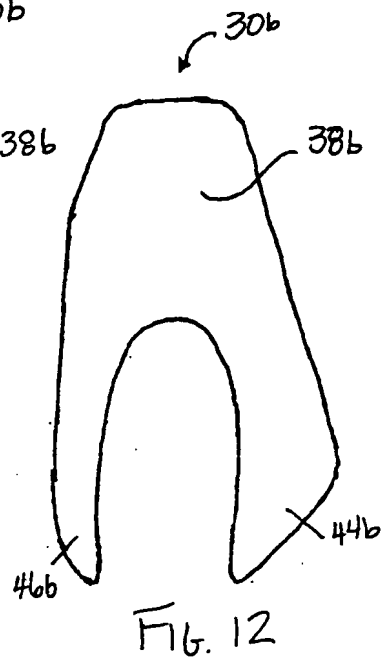
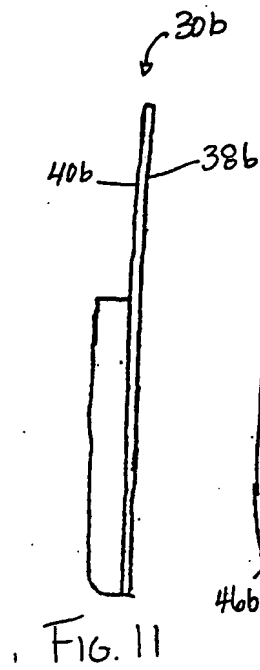
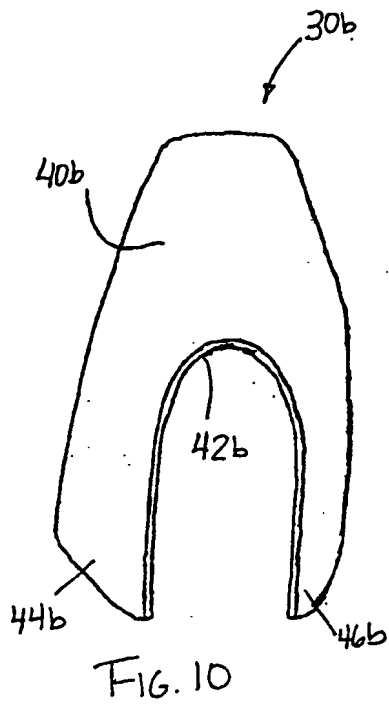
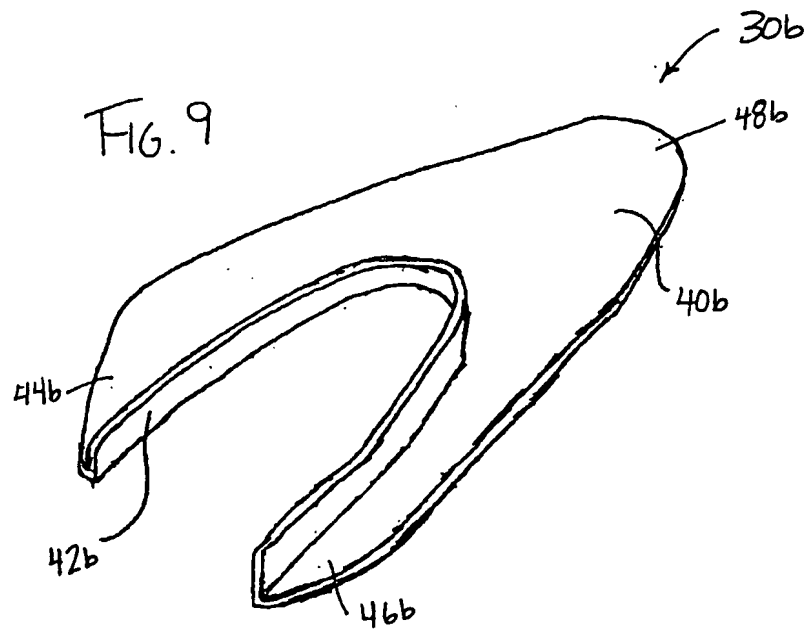


FIG. 4A





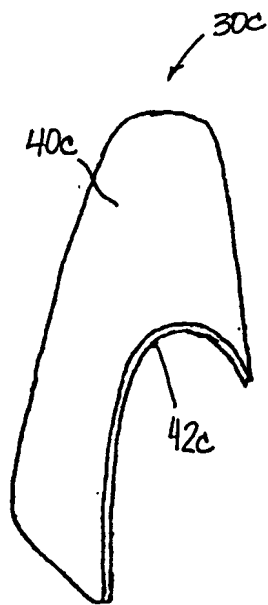
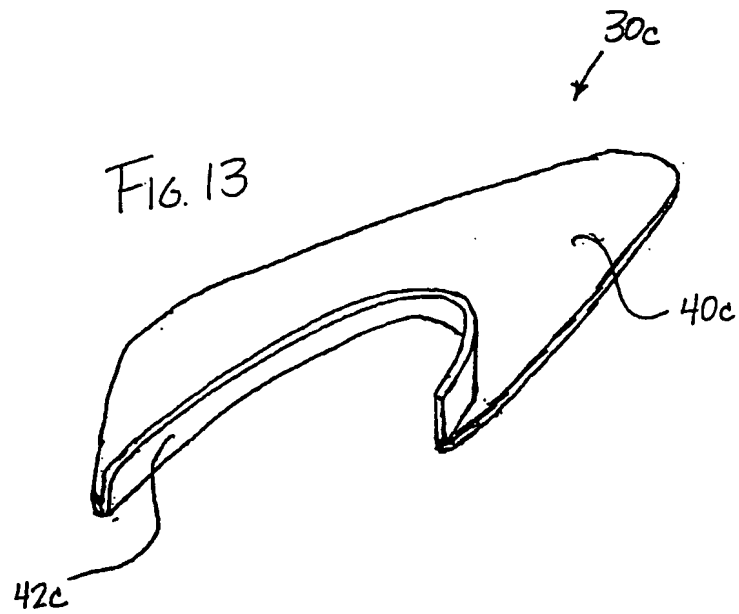


FIG. 14

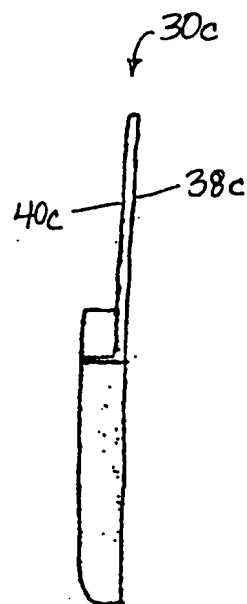


FIG. 15



FIG. 16

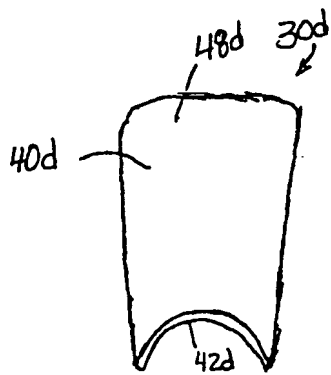
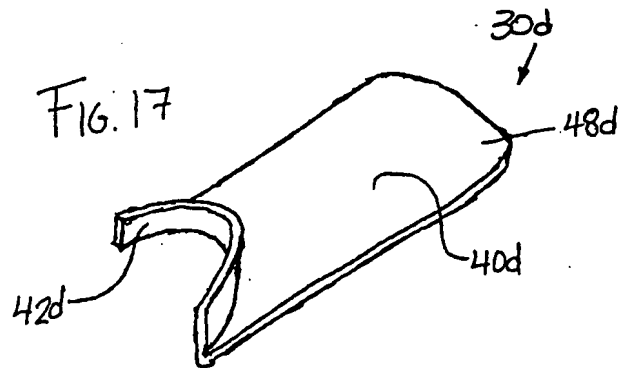


FIG. 18

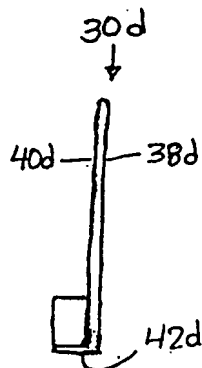


FIG. 19

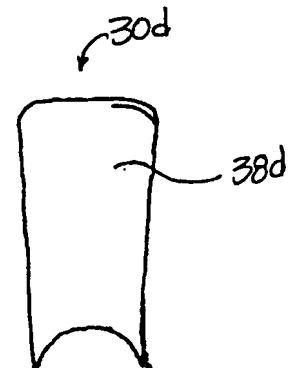


FIG. 20

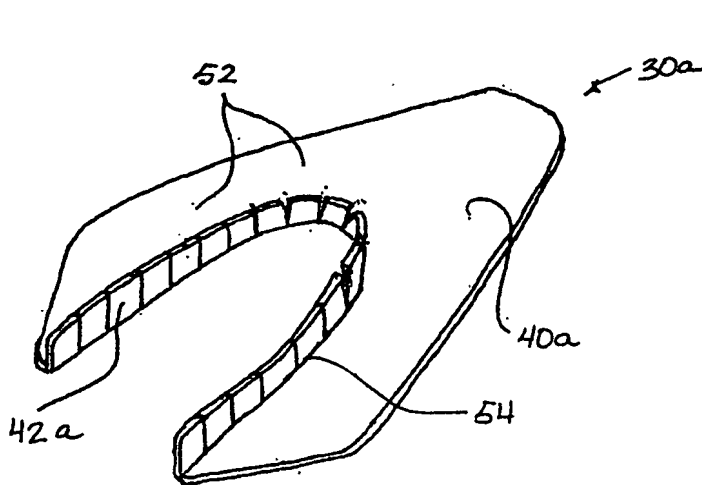


FIG. 21

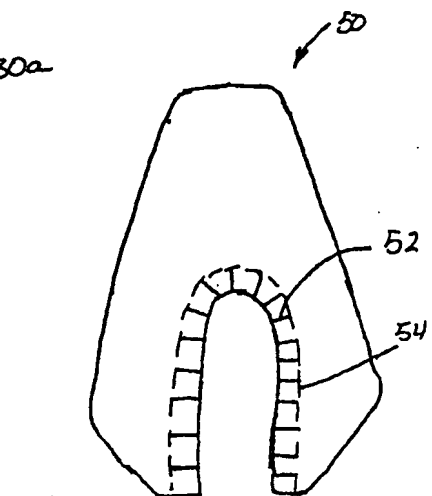
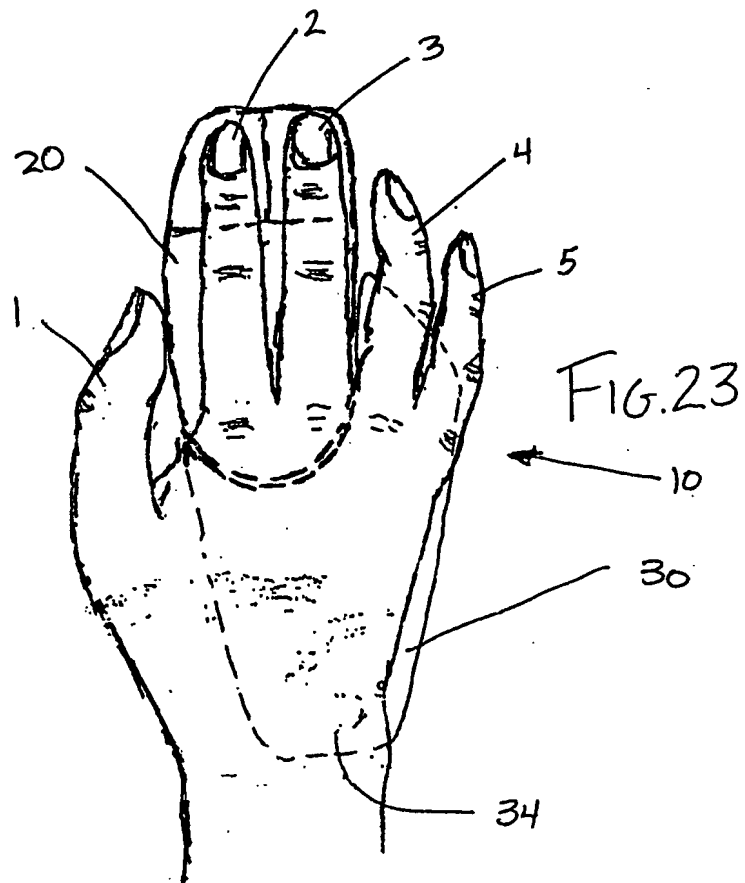


FIG. 22



INTERNATIONAL SEARCH REPORT

International application No.
PCT/US00/02295

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : G09G 5/08

US CL : 345/156, 163

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 345/156, 163, 168

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
Please See Extra Sheet.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y	US 5,340,067 A (MARTIN et al) 23 August 1994, col. 3, lines 18-21, lines 53-68, col. 4, lines 1-9, lines 20-23, lines 43-44, lines 60-68, figures 1 and 3.	1-2, 4-13, 15, 17-20 ----- 3, 14, 16
Y	US 5,788,195 A (RICE) 04 August 1998, abstract, figures 3A, 4, 5A and 5B.	3, 14, 16

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:	*T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
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L document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	*Z* document member of the same patent family
O document referring to an oral disclosure, use, exhibition or other means	
P document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search

30 APRIL 2000

Date of mailing of the international search report

16 MAY 2000

Name and mailing address of the ISA/US
Commissioner of Patents and Trademarks
Box PCT
Washington, D.C. 20231

Facsimile No. (703) 305-3230

Authorized officer

HENRY N. TRAN

Telephone No. (703) 308-8410

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US00/02295

B. FIELDS SEARCHED

Electronic data bases consulted (Name of data base and where practicable terms used):

EAST.

Search terms: (mice or mouse or keyboard) and support and wrist and hand and (attach\$3 or connect\$3) and surface and housing and button\$ and (confort or injury or fatigue).